



How To Build a Virtual World?

- How To Write A Book?
 - Novel?

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- Non-Fiction?
- Dictionary?
- Poetry?
- Pop-up?
- Field Guide?

- Different genres require different...
- Research
- Storyboards
- Interviews
- Prototypes
- Artwork/Photos

Genres of VR	
 Entertainment Scientific Visualization Simulation Education Remote Manipulation Probably others 	Different genres require different Artistic Skill Modeling Talent Storyboards Realtime Data Acquisition Audio Expertise





















Examples

- · Java3D
- Inventor
- Performer
- Superscape
- Even Higher Level: WorldUp



Optimizations Are Possible

- · High level of abstraction, more power
- Cell-level culling, distance culling, parallelism,
- LOD Control
- Storing, fetching, scheduling of geometry to hardware pipeline(s)
- · Implementation is left to graphics experts

Level of Detail

- Provide very low polygon count versions of a model for use when model is at a distance, in fog, moving fast
- Requires a sophisticated runtime to know when to switch models and to prevent "popping"













The VR Simulation Frame

- · Events
 - Run Callbacks from the Events In Event Queue

The VR Simulation Frame

- · Clock-based animations
 - Any Value Can Be Animated
 - Position, Orientation, Color,
 - Application variables: e.g. "hunger level for predators"
 - Start=0, End=100, Time=1sec
 - Look at system clock, time elapsed
 - Interpolate value based on time elapsed
 - set values





Animation Is Another Talk

- This can be a <u>very</u> complex subsystem
- Interpolation functions
- Pre/post functions
- Predictive Behavior
- Rendering Critical Frames
- Synchronization

Per Frame Actions

- Frame-based animations often callbacks
 - Collision Detection
 - Numerical simulation step
 - Interobject message passing





People: Basic Skill Sets

- Modelers
 - Build 3D objects
- Texture Artists
 - Create Bitmaps, map them to objects
- Audio Designers
 - Compose/mix sound clips
- Programmers
 - Graphics: Draw things fast (Scene Graph)
 - App: Object Behavior, simulation, interface, app logic
 - Sometimes same person, sometimes not



- Some Fields Make Less Use of Static Models
 - Scientific Visualization
 - Remote Manipulation
- Some Fields, it is Everything
 - Games



- Work Within a low "Polygon Budget"
- Remember Performance Goal of 30 fps
- This is a temporary condition, moving target
- Realtime Raytracing....someday soon?





A Description of the second structure of the



Using Object Names In Code . Later, in the simulation.... rotate(Airplane.left_wing.engine.prop,...)



• Questions?

Modeling gets you shape. What about Appearance?



Adding Texture

 Adds high-frequency detail that would be unreasonable to achieve through polygons and color





































Other I/O Devices: exotic

Data gloves

- Fiber optic bend in fingers
- Pinch Gloves
 - Conductive contact pads on fingers/palm
- · Chording keyboards
- Haptic/Force feedback



